

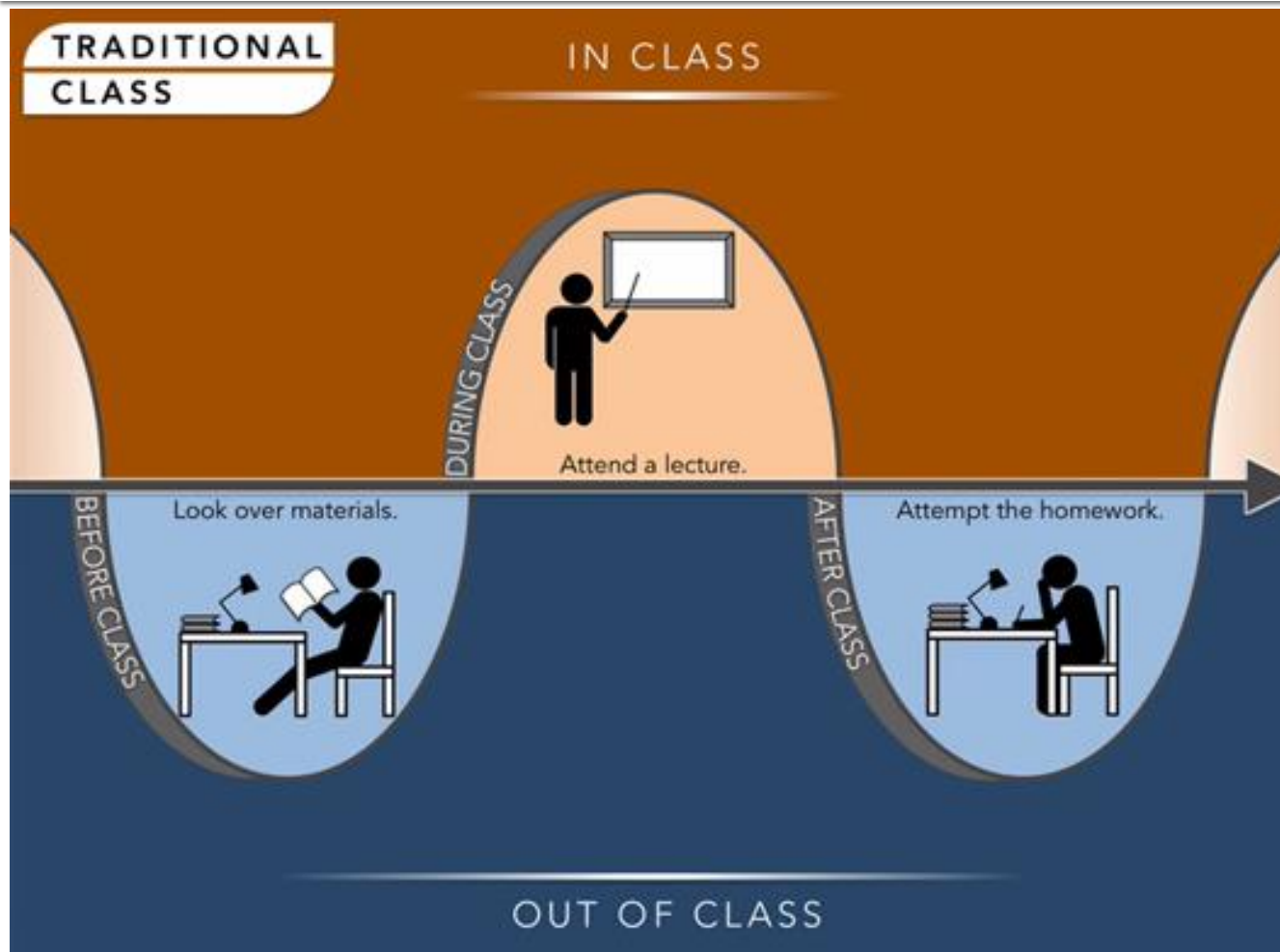
Effectiveness of Inverting an Introductory College Physics Course

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Overview

- What is a standard and inverted course?
- Why invert the classroom?
- Weekly Schedule
- Algebra-Trig Skills and Exam Correlation
- Force Concept Inventory
- Practical Issues

The Standard Course Design



Standard Course Design

Read Chapter

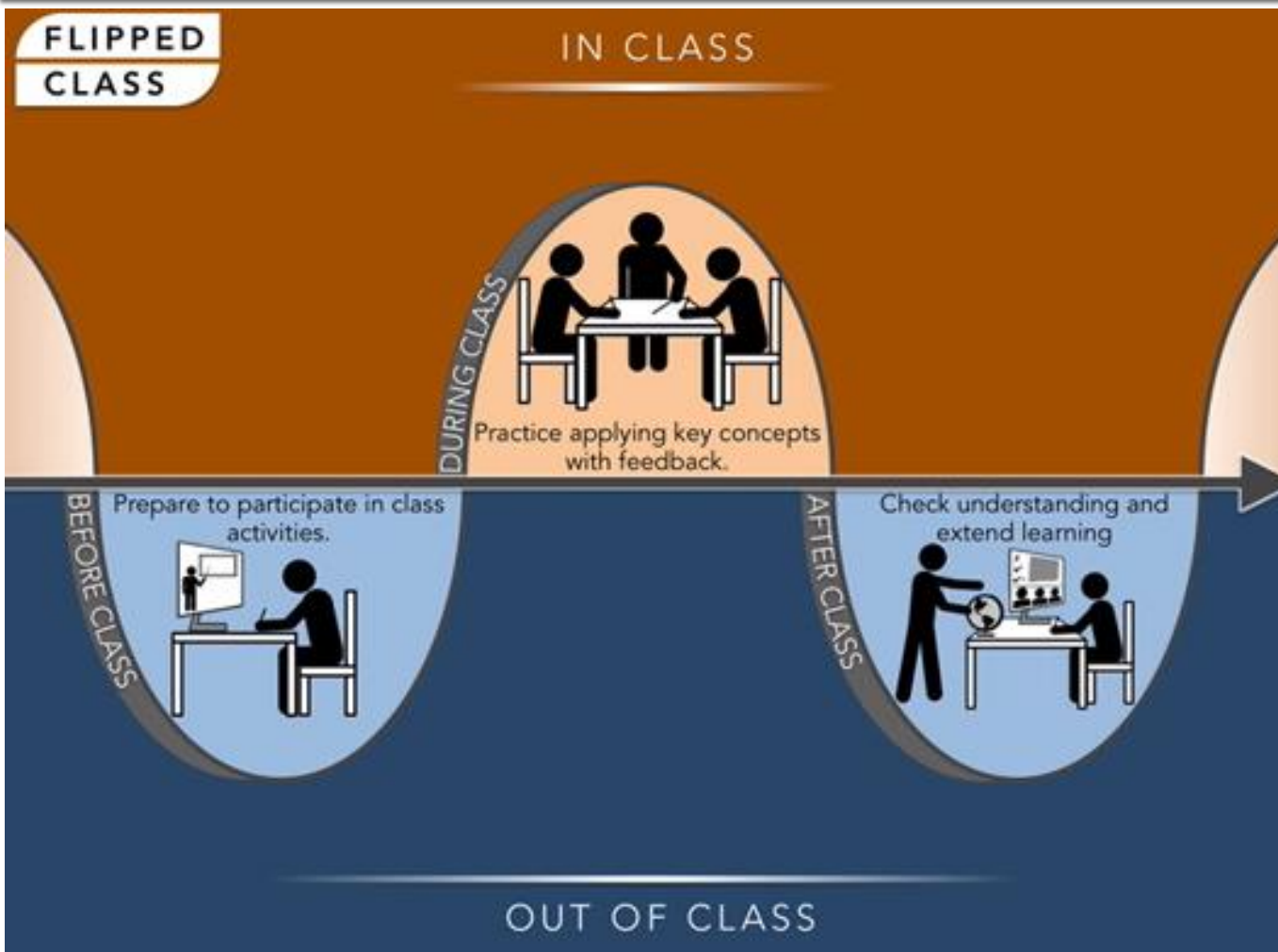
In-class Lecture

Attend Lab/Recitation

Do Homework

Exams during Lecture

The Inverted Course Design



Inverted Course Design

Read Chapter

Streamed Lecture

In-class interactive activities

Attend Lab/Recitation

Finish Homework

Exams on Friday

Why Invert the Classroom?

- Appeal to a variety of learning styles
- Promote student responsibility
- Engage in student-teacher interaction
- Easier to focus on specific applications

Objective

- **Purpose of study:** determine the effectiveness and feasibility of inverting an introductory college physics course.
- **Measurement tools:** grade distributions, standardized exams, assessments of different implementation methods.

Weekly Schedule

Inverted Class

In-Class
-Activity

Outside of Class
-watch lecture video

In-Class
-begin homework

In-Class
-Q&A

Outside of Class
-read chapter
-watch lecture video
-complete homework

Mon

Tues

Wed

Thurs

Fri

Sat

Sun

In-Class
-Lecture
(recorded)

In-Class
-Lecture
(recorded)

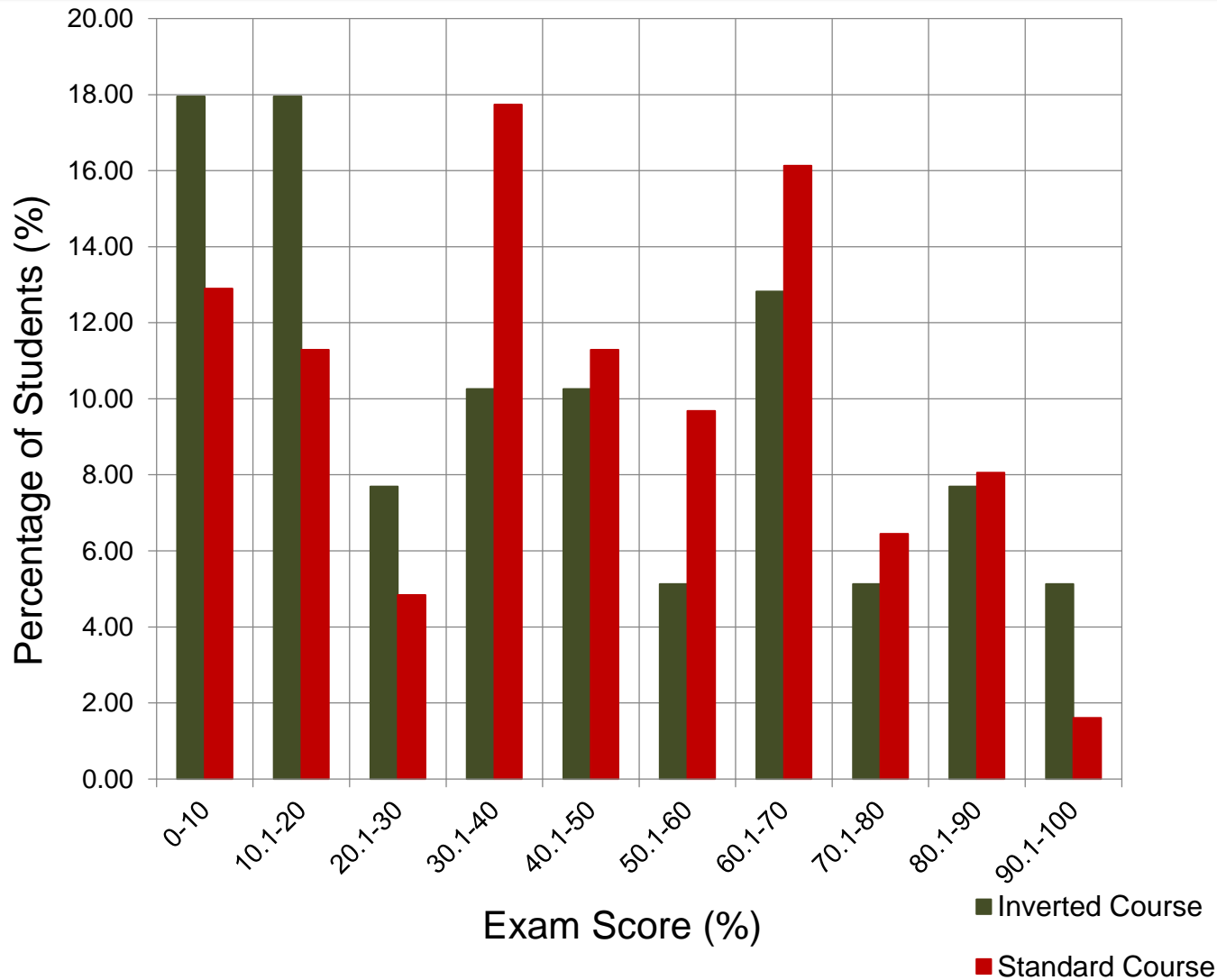
Outside of Class
-read chapter
-complete homework

Standard Class

Student Profile

- Out of sequence course
 - Retaking
 - Adjusted Schedule
- Pre-professional track
 - Pre-requisite
 - Not Physics/Engineering Majors

Algebra-Trig Entry Exam



Inverted Class

Avg: 39.8%

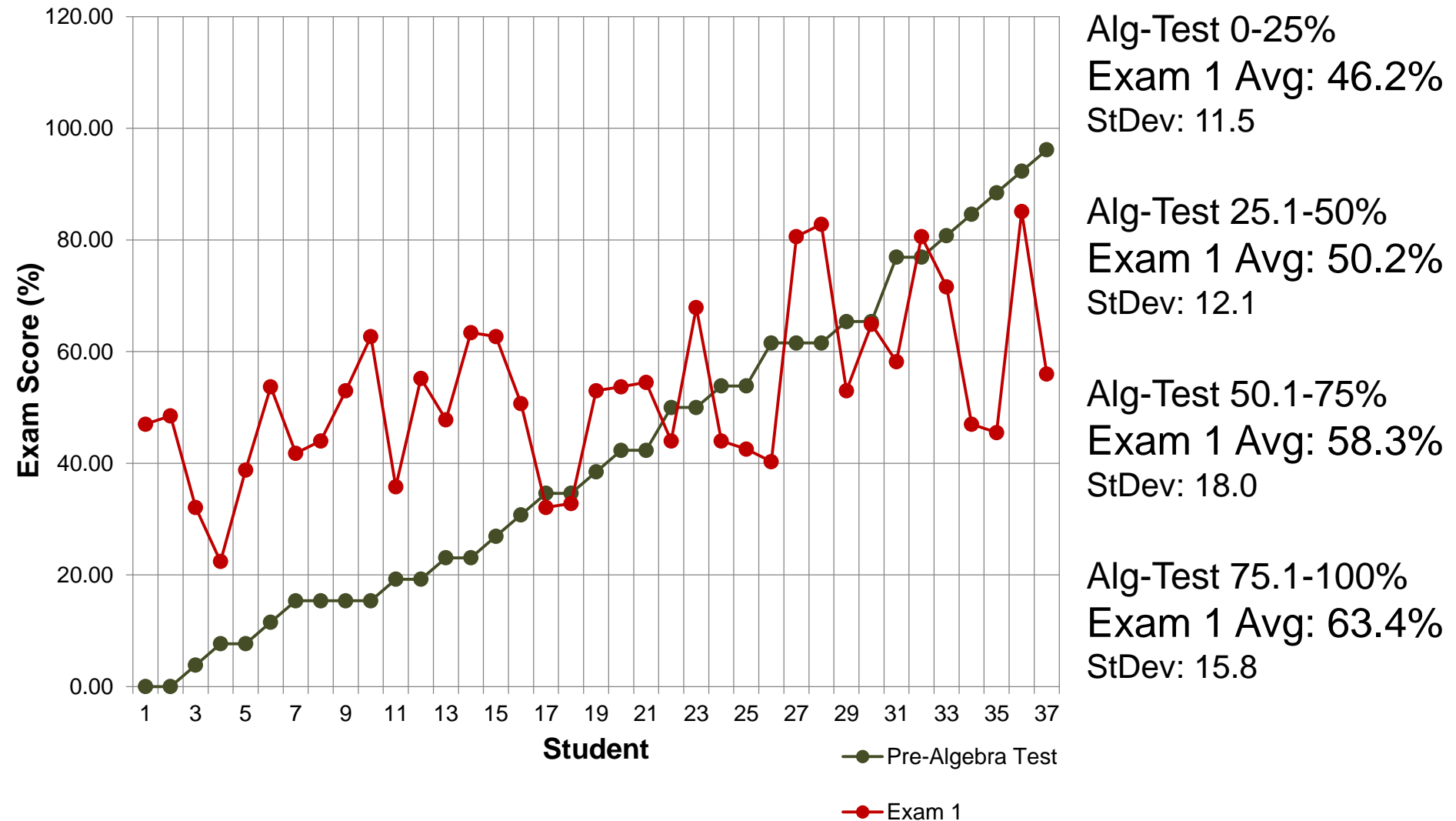
StDev: 29.1

Standard Class

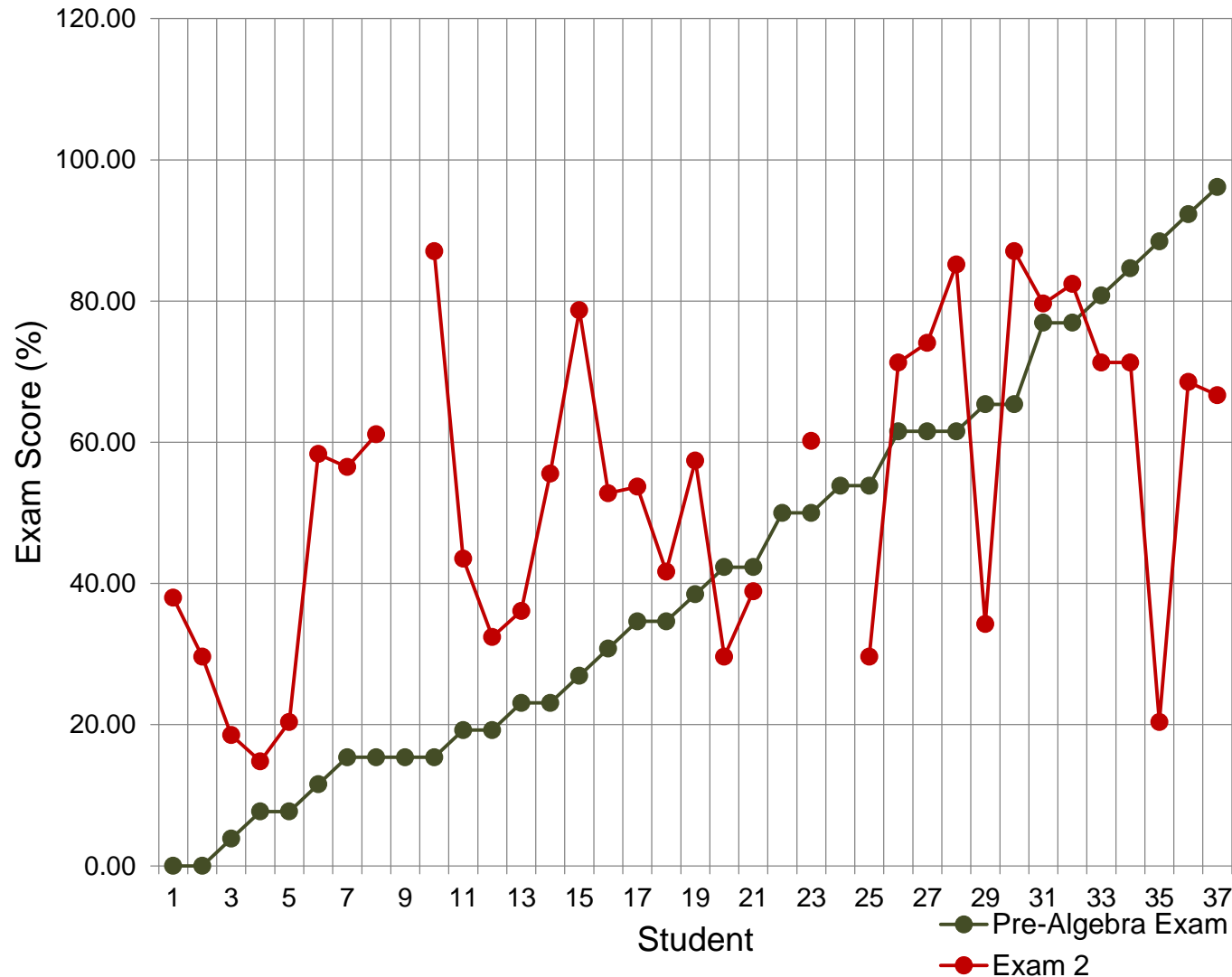
Avg: 43.6%

StDev: 26.4

Entering Algebra Skills vs Exam 1



Entering Algebra Skills vs Exam 2



Alg-Test 0-25%

Exam 2 Avg: 42.5%

StDev: 20.6

Alg-Test 25.1-50%

Exam 2 Avg: 51.6%

StDev: 15.1

Alg-Test 50.1-75%

Exam 2 Avg: 63.6%

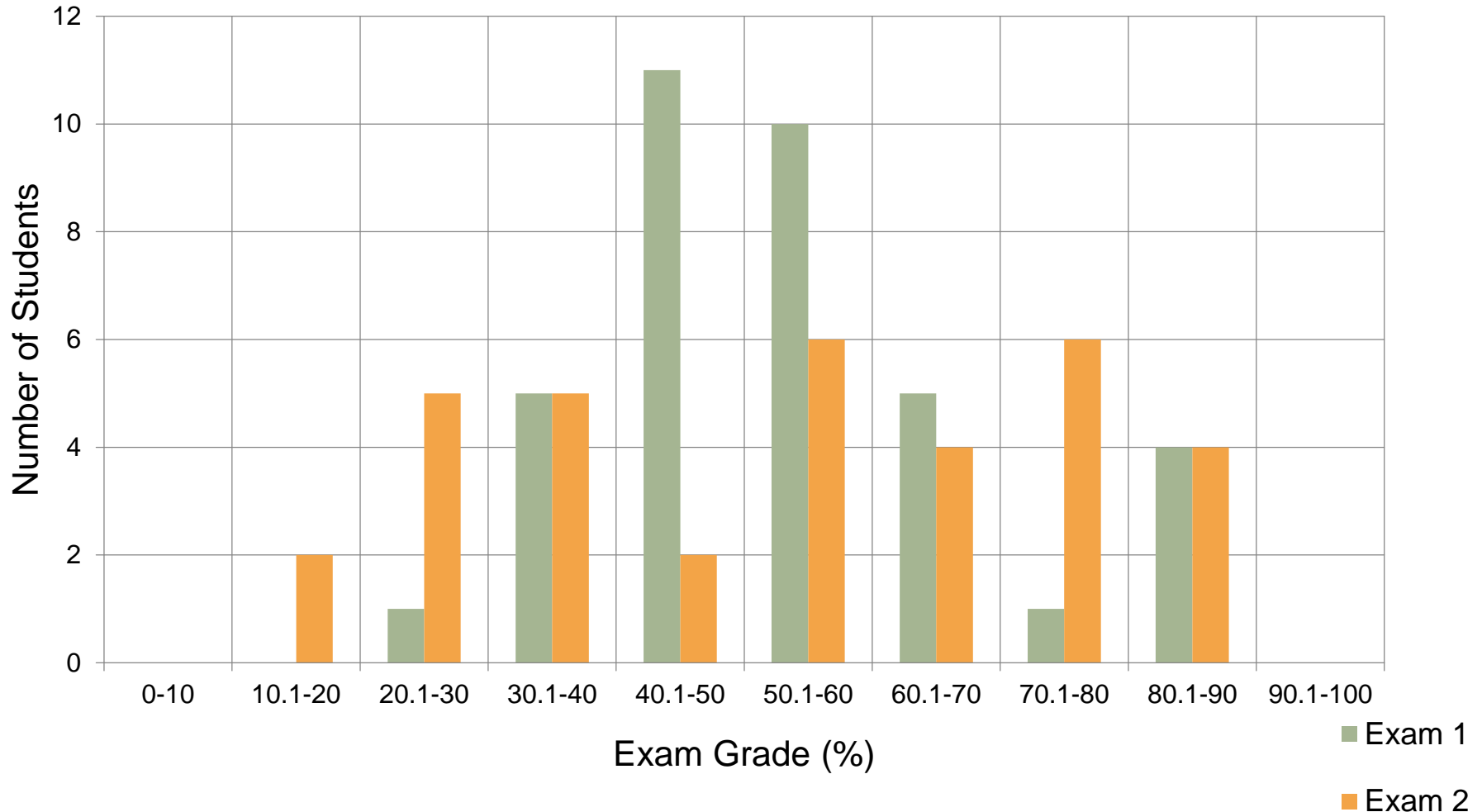
StDev: 25.3

Alg-Test 75.1-100%

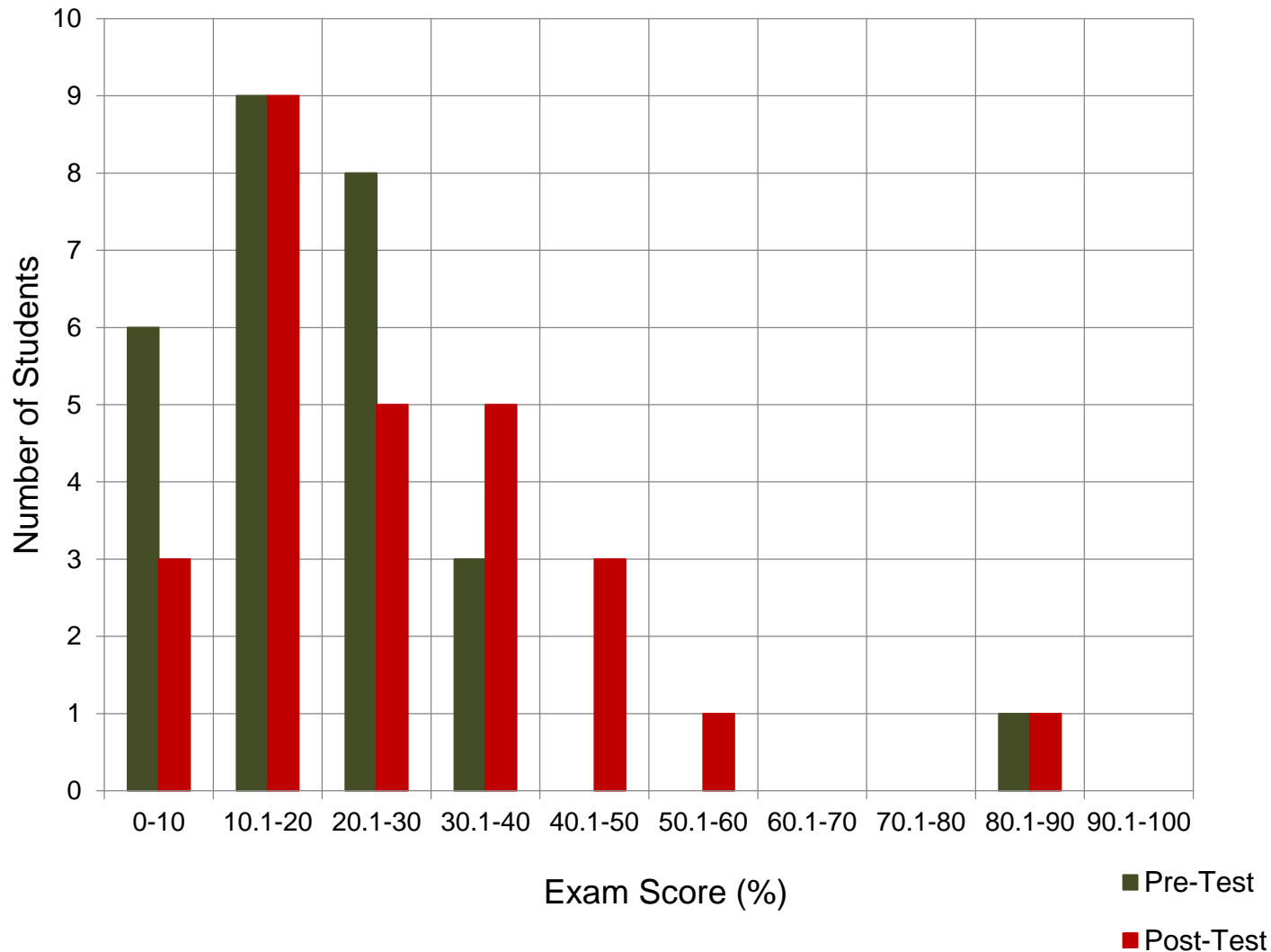
Exam 2 Avg: 65.7%

StDev: 20.8

Exam 1 and 2 Grade Distributions



Force Concept Inventory



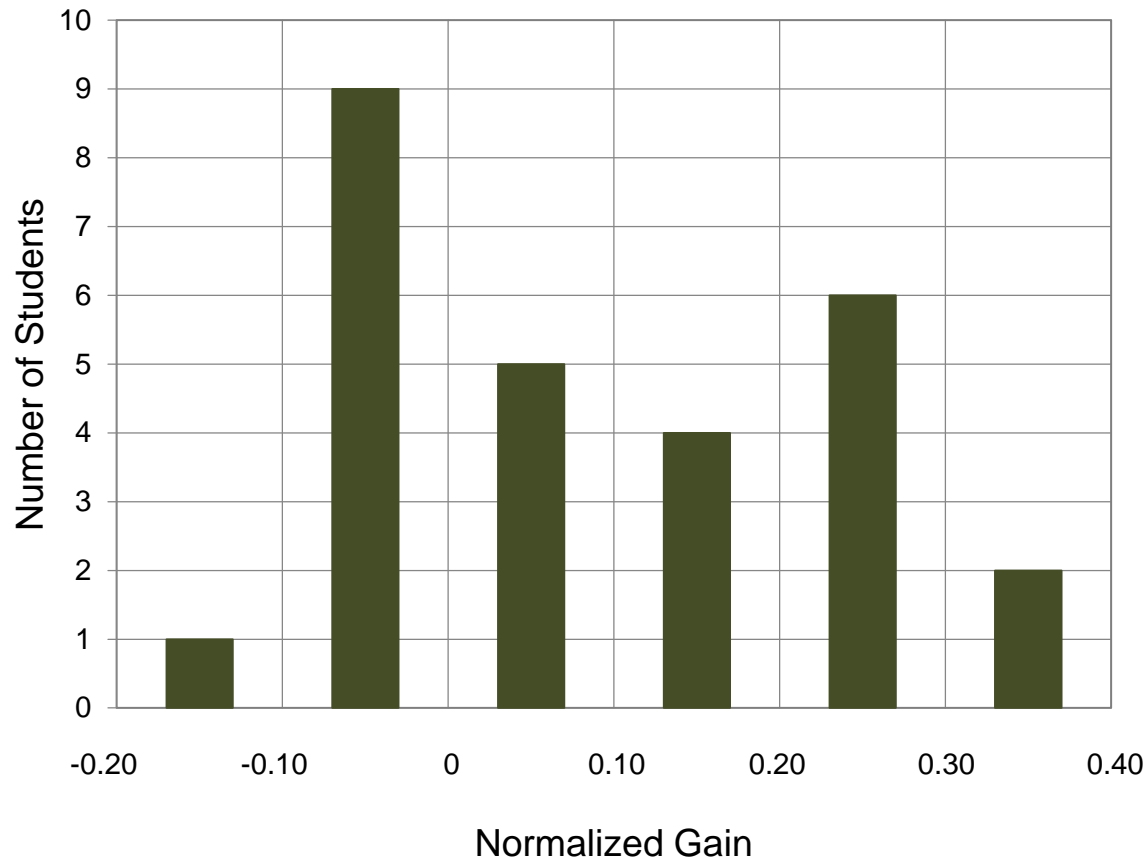
Pre-Test

Avg: 22.2%
StDev: 15.6

Post-Test

Avg: 29.3%
StDev: 18.1

Force Concept Inventory



Inverted Course

Avg Gain: 7.1%

Avg Norm Gain: 0.10

Normalized Gains:

National Avg: 0.23

NC State Univ.: 0.10

Univ. Central FL: 0.20

Univ. N. Hampshire: 0.24

Rochester Institute of Tech: 0.30

UAB Previous Semester: 0.30

Other University Information From:

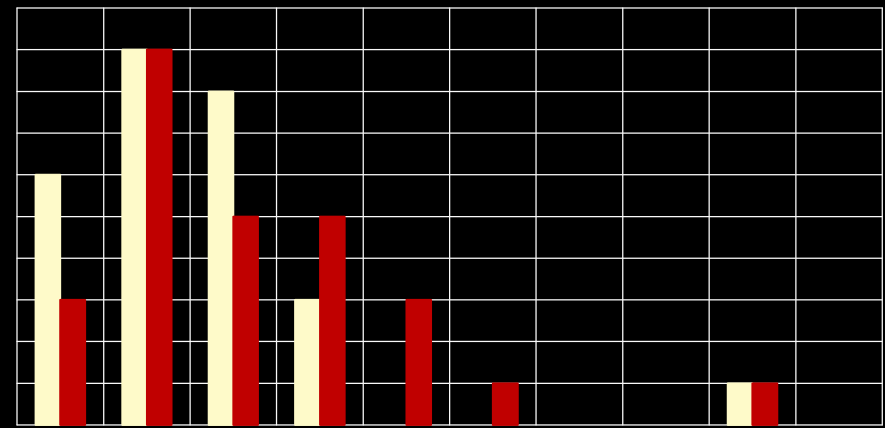
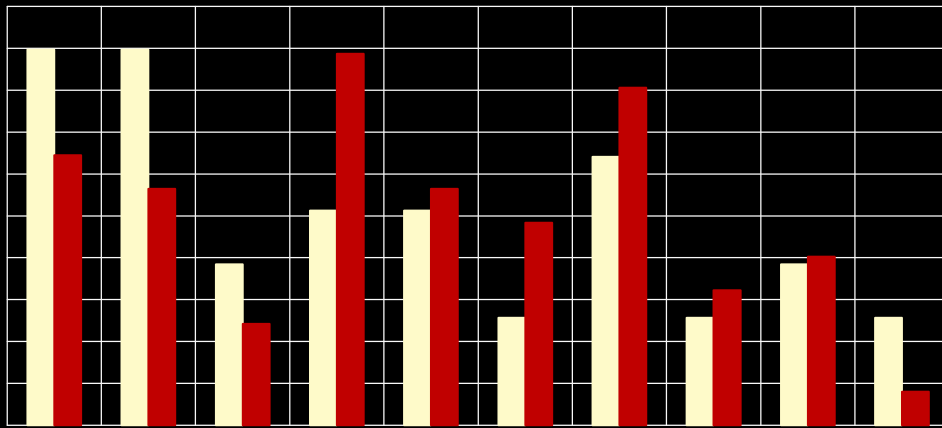
http://www.pkal.org/documents/Beichner_SCALEUP_Interview.cfm

Practical Issues

- Pre-recorded lectures work most efficiently
 - Update every 2 years
 - 15-25 minute videos
- Standard Definition recordings
 - Compression and Uploading: 2 hours
 - Turn-around time: 10-20 hours
- High Definition recordings
 - Compression and Uploading: 5-6 hours
 - Turn-around time: 10-20 hours

Conclusions

- The criticism of the inverted course design is possibly supported by exam results.
- The FCI exam is not necessarily the best tool for determining effectiveness depending how the course is focused.
- It is best to pre-record segmented videos in standard definition to reduce time constraints.



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